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<p>(21) International Application Number: PCT/EP84/00129 (22) International Filing Date: 27 April 1984 (27.04.84) (31) Priority Application Number: G 83 13 720.3 U (32) Priority Date: 9 May 1983 (09.05.83) (33) Priority Country: DE (71) Applicant: ENITOR B.V. [NL/NL]; 7-9 Beatrixstraat, P.O. Box 1, NL-9285 ZV Buitenpost (NL). (72) Inventor: SCHOOTSTRA, Jan, Harm ; 7-9 Beatrixstraat, NL-9285 ZV Buitenpost (NL). (74) Agent: ENITOR B.V.; Muller & Eilbracht B.V., 4, Leidsenhage Jasmijnhof, P.O. Box 1080, NL-2260 BB Leidschendam (NL).</p>		<p>(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), DK, FI, FR (European patent), GB (European patent), LU (European patent), NL (European patent), SE (European patent). Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>
<p>(54) Title: FLEXIBLE CONDUIT FOR THE TRANSPORT OF MEDIA</p>		
<div data-bbox="521 1352 1205 1610" data-label="Image"> </div>		
<p>(57) Abstract</p> <p>A flexible conduit or hose (1) which has a generally flattened cross-section in the absence of a flow of a fluid media therethrough and an expanded cross-section during the transportation of a fluid media. The construction of the conduit is such that in its flattened condition the wall portions (3, 4) forming the major part of the conduit construction concavely curve to contact each other so that any residual liquid in the conduit is automatically expelled from the conduit on cessation of liquid flow.</p>		

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FLEXIBLE CONDUIT FOR THE TRANSPORT OF MEDIA

This invention relates to the transportation of media by way of a conduit which is sufficiently flexible to enable the conduit to be coiled when not required for use. Such coiling may be effected merely by

5 progressively coiling the length of conduit into a series of side-by-side loops and then using some form of ties to hold the coiled loops in position to prevent tangling of the coiled conduit. Alternatively the flexible
10 conduit is coiled or wound onto a support drum having side cheeks such that the coils or turns of the winding are not only supported by the drum but are also prevented from relative displacement by the side cheeks.

In the case of the well known form of flexible conduit
15 commonly used for domestic and commercial purposes for the transport of air, water or other flowable materials or media the conduit (commonly called a hose) has a circular cross section both when in use and when coiled.

Since the conduit retains the circular cross section
20 when not in use the volume of the coiled conduit is correspondingly sized. In practice, the volume of the coiled flexible conduit imposes a restriction on the amount i.e., length of conduit that can be wound onto a drum of given cheeks diameter and core length and
25 diameter.

Further problems arise in the need to empty a conduit after it has been used. This is particularly the case in the transportation of water for garden use or other household use in that the hose is caused automatically
30 to empty as the coiling process is effected.



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Broadly, according to a first aspect of the invention there is provided a flexible conduit for the transportation of fluids, wherein the conduit is so formed that in the absence of pressurised fluid flow therethrough the conduit automatically assumes a generally flattened cross-section as compared with its cross-section in the presence of a pressurised fluid flow therein.

In a preferred construction the conduit has a generally circular or oval cross-section when under pressure and an elongate flattened form in the absence of such internal pressure.

Conveniently, those parts of the conduit that provide the end portions of the conduit when the latter is in its flattened form have a greater wall thickness than the remainder of the wall of the conduit.



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For a better understanding of the invention and to show how to carry the same into effect reference will now be made to the accompanying drawings in which

5 Figure 1 is a cross-sectional view of a first embodiment of a flexible conduit of the invention, the Figure illustrating the conduit when in its rest or quiescent condition;

10 Figure 2 is a cross-section of the flexible conduit of Figure 1, the Figure 2 illustrating the conduit when in its expanded or working condition;

Figure 3 is a cross-sectional view of a second embodiment of the flexible conduit of the invention, the Figure 3 illustrating the conduit when in its rest or quiescent condition;

15 Figure 4 is an oblique view of the flexible conduit of Figure 3;

20 Figure 5 is a cross-sectional view of a third embodiment of the flexible conduit of the invention, the Figure 5 illustrating the conduit when in its rest or quiescent condition;

Figure 6 is a cross-sectional view of a fourth embodiment of the flexible conduit of the invention, the Figure 6 illustrating the conduit when in its rest or quiescent condition;

25 Figures 7 and 8 each comprise a cross-sectional view of an arrangement for holding the facing walls of the conduit when in a quiescent condition in contact with each other; and

30 Figure 9 schematically illustrates a possible construction for a conduit of the invention which provides two separate ducts for the flow of fluid.



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Referring now to Figures 1 and 2 and more particularly to Figure 1 the flexible conduit 1 shown therein is formed from an elastomeric material such as rubber or plastics material such as, for example, a rubber based formulation incorporating the requisite fillers and other materials or a plastics material affording the desired degree of resiliency or the like.

The tubular conduit 1 is so formed that it has an elongate slit like bore 2 which is effectively bounded by a top wall part 3, a bottom wall part 4 and opposed end regions 5 and 6.

When the interior of the conduit is pressurised by the passage of a liquid such as water under a conventional or standard mains pressure, the flow of liquid distorts or expands the tubular conduit into a generally circular cross-section as is shown in Figure 2. Because of the particular rest or quiescent formation of the conduit as shown in Figure 1 the end regions 5 and 6 do not necessarily fully distort or expand to the circular form whereby the expanded flexible conduit exhibits a protuberance 7 running lengthwise of each side of the expanded conduit.

This protuberance may be produced solely by the interaction between the initial shape and the resiliency of the material of the conduit end regions which would require a considerable internal pressure to be produced within the conduit to eliminate the protuberances. Alternatively the thickness of the wall of the conduit may be thicker at the end regions than the thickness of the remainder of the conduit. A consequence of the above discussed formation of the conduit is that the profile of the latter will upon relaxation of the



pressurisation of the media, i.e., water, automatically return to the initial rest or quiescent condition shown in Figure 1 and in so doing will expel any media remaining within the bore of the conduit.

5 A further mode of producing the protuberances is shown in Figures 3 and 4. As can be seen a lengthwise extending projecting rib 8 is provided along each end region 5,6 of the conduit. Each rib 8 inter alia provides a stiffening effect which constrains the end
10 regions against expansion or shape distortion and which assists in providing the inherent rest or quiescent conduit profile, whereby upon release of internal pressure the internal resiliency of the conduit material at the end regions facilitates the collapse of the conduit
15 back to its initial condition as shown in the Figures

The elongate strips may be formed integrally with the conduit or added subsequently. The use of the strips provides a reinforcement to the overall structural strength which aids the return to the rest position.

20 A plurality of the reinforcement strips may be provided. Thus Figure 5 illustrates an arrangement incorporating six reinforcing strips. These strips are shown at 9,10,11,12,13 and 14.

25 It is found in practice that the provision of the strips in the near vicinity of the end regions 5,6 provides an increased stiffness to the ends and thereby enhances the tendency for the conduit automatically to return to the rest condition upon release of internal pressure.



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Figure 6 schematically illustrates a conduit structure with internally provided ribs 15 which provide the internal counterparts to the ribs 9, 10, 12 and 13 of Figure 5. In the Figure 6 the conduit 1 is shown in its rest or quiescent condition. In the Figures 5 and 6 it will be noted that the walls 3 and 4 have been shown as being deformed inwards to a concave shape. In practice, such concave shape occurs with the internal faces of the walls 3 and 4 in contact at least over the central regions thereof. This concave feature helps to ensure that the internal volume of the conduit is minimised as much as possible by the natural tendency of the conduit to return to the rest condition thereby ensuring that the maximum amount of any residual material is driven out from the conduit upon relaxation of pressurisation, before the commencement of the coiling of the conduit.

If desired, as is schematically shown in Figure 7 a conduit construction may comprise two separate conduits 16 and 17 which are arranged side-by-side and connected by a common connecting wall 18. A variation is to provide a narrow web which can be long enough to allow the conduits 16 and 17 to be arranged one above the other when coiling onto a drum or the like. The provision of the double conduit makes it readily possible to feed two different materials to a common delivery point. Such a requirement is often a useful feature in industrial and commercial usages of conduits.

A possible example, is the feed of two different gaseous materials i.e., air and hydrogen or the feed of two different liquid materials to a mixing location. A further possibility is the feed of a liquid and other form of material.



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In order to enhance the retention of the conduit in its rest or quiescent condition until the interior of the conduit is pressurised arrangements can be provided for effectively locking the internal surfaces of the walls 3 and 4 together. Figure 8 schematically illustrates an interlocking system formed by a dovetail interlocking arrangement 19 including a male dovetail part 20 and a female dovetail part 21. In view of the resiliency of the material of the conduit the dovetail parts will interconnect on collapse of the walls during the movement of the conduit to its quiescent condition and the subsequent coiling. Since Figure 8 illustrates only a fragmentary part of a conduit formation only one such interlocking arrangement is shown. In practice, two or more arrangements may be provided depending upon the overall dimensions of the conduit.

An alternative form of an interlocking arrangement 19 is shown in Figure 9. In Figure 9, which illustrates a fragmentary portion of a conduit, the interlocking arrangement comprises two series of saw teeth 22, 23 whose apices are shaped to provide hook-like parts which interlock one with the other as the two series are brought into contact on the movement of the conduit walls 3 and 4 to the quiescent position.



CLAIMS

1. A flexible conduit for the transportation of fluids, wherein the conduit is so formed that in the absence of pressurised fluid flow therethrough the conduit automatically assumes a generally flattened cross-section as compared with its cross-section in the presence of a pressurised fluid flow therein.
2. A flexible conduit or hose for the transportation of a fluid media or medium, wherein the conduit has a generally flattened cross-section in the absence of a fluid media or medium flow therethrough, and an expanded cross-section during pressurised flow of fluid media or medium therethrough, and wherein on cessation of such pressurised flow the conduit automatically returns to its flattened cross-section thereby assisting in the expulsion of the fluid media or medium from the interior of the conduit.
3. A flexible conduit as claimed in claim 1 or 2, wherein the conduit has a generally circular or oval cross-section when under pressure and an elongate flattened form in the absence of such internal pressure as caused by fluid media or medium flow.
4. A flexible conduit as claimed in claim 3, wherein those parts of the conduit that define the end regions of the conduit when in the flattened condition have a greater wall thickness than the wall thickness of the remainder of the conduit.



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5. A flexible conduit as claimed in claim 1, 2, 3 or 4, wherein ribs or the like are provided for stiffening the walls of the conduit, said ribs being either internally or externally located and extending lengthwise of the conduit.

6. A flexible conduit as claimed in claim 5, wherein the ribs or the like are formed integrally with the wall of the conduit.

7. A flexible conduit as claimed in claim 5, wherein the ribs or the like are secured to the conduit after the formation of the latter.

8. A flexible conduit as claimed in any one of the previous claims, wherein the formation of the conduit is such that when the conduit is in a flattened condition the wall portions thereof providing the flattened region are concave towards each other.

9. A flexible conduit as claimed in claim 8, wherein said wall portions contact each other.

10. A flexible conduit as claimed in claim 9, wherein means are provided for interlocking the contacting wall portions.

11. A flexible conduit as claimed in claim 10, wherein the interlocking means comprises a dovetail arrangement, including at least one pair of interlockable male and female dovetail joint parts.

12. A flexible conduit as claimed in claim 10, wherein the interlocking means comprises two series of saw teeth whose apices are shaped to provide hook-like or other interlockable parts, the arrangement being such that said parts interlock when the wall portions move into contact with each other on removal of liquid media or medium pressure.



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13. A flexible conduit construction and arranged to operate substantially as hereinbefore described with reference to Figures 1 and 2; Figures 3 and 4; Figure 5, 6, 7, 8 or 9 of the accompanying drawings.



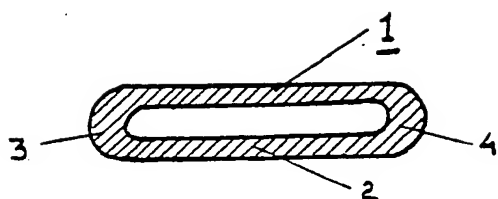


Fig. 1

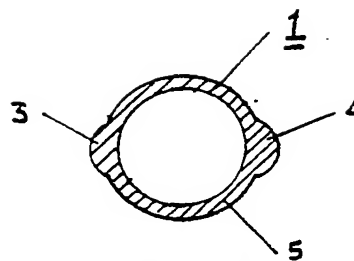


Fig. 2

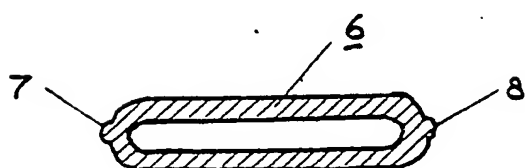


Fig. 3

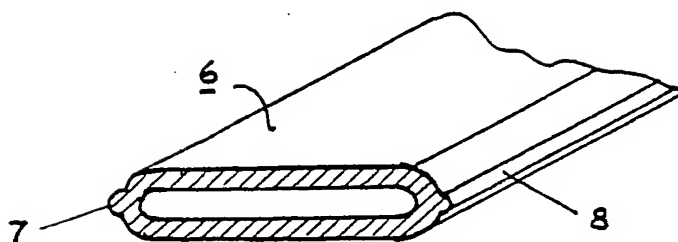


Fig. 4

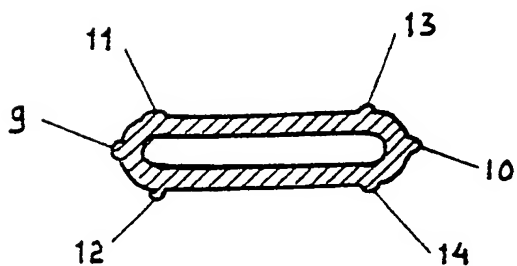


Fig. 5

INTERNATIONAL SEARCH REPORT

International Application No PCT/EP 84/00129

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) *		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC ³ : F 16 L 11/12		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁴		
Classification System	Classification Symbols	
IPC ³	F 16 L	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁵		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴		
Category *	Citation of Document, ⁶ with Indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁸
X	FR, A, 1417987 (BERNE) 11 October 1965, see the entire document --	1, 2, 3, 4, 5, 6, 9, 13
X	FR, A, 1234912 (DECAUX) 23 May 1960, see the entire document --	1, 2, 3, 9, 13 5, 6
A	--	
X	US, A, 4095618 (SPENCER) 20 June 1978, see abstract; figures --	1, 2, 3, 5, 6, 8, 13
X	US, A, 3508587 (MAUCH) 28 April 1970, see column 5, lines 13-37; figures -----	1, 2, 3, 5, 6, 7, 9, 13
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>* Special categories of cited documents: ¹⁶</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p> </div> </div>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search ¹	Date of Mailing of this International Search Report ²	
29th August 1984	21 SEP. 1984	
International Searching Authority ³	Signature of Authorized Officer ¹⁰	
EUROPEAN PATENT OFFICE	G.L.M. Kruydenberg	

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

V. ☒ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE ¹⁰

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☐ Claim numbers because they relate to subject matter ¹² not required to be searched by this Authority, namely:

2. ☒ Claim numbers 10-12 because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out ¹³, specifically:

Figures 6 to 9 are missing. For this reason, claims 10, 11 and 12, which are referring to this part of the application, have not been searched.

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING ¹¹

This International Searching Authority found multiple inventions in this international application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International search report covers all searchable claims of the international application.
2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:
3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:
4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

- ☐ The additional search fees were accompanied by applicant's protest.
☐ No protest accompanied the payment of additional search fees.

ANNEX TO INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. PCT/EP 84/00129 (SA 7066)

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 11/09/84

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR-A- 1417987		None	
FR-A- 1234912		None	
US-A- 4095618	20/06/78	US-A- B570382 US-A- 4385727	13/04/76 31/05/83
US-A- 3508587	28/04/70	None	

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